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(12) **EX PARTE REEXAMINATION CERTIFICATE** (5393rd)**United States Patent****Grabowsky et al.**(10) **Number:** **US 6,181,990 C1**(45) **Certificate Issued:** **Jun. 6, 2006**(54) **AIRCRAFT FLIGHT DATA ACQUISITION AND TRANSMISSION SYSTEM**(75) **Inventors:** John Francis Grabowsky, Camarillo, CA (US); David Ray Stevens, Simi Valley, CA (US)(73) **Assignee:** Teledyne Technologies Incorporated, Los Angeles, CA (US)

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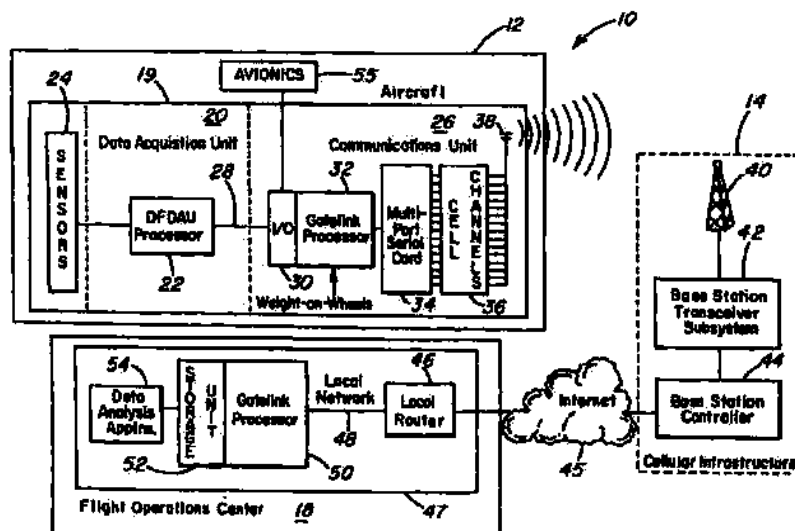
*Primary Examiner*—Y. Beaulieu(57) **ABSTRACT**

An aircraft data transmission system used with an aircraft having a data acquisition unit. The system includes a communications unit located in the aircraft and in communication with the data acquisition unit. The system also includes a cellular infrastructure in communication with the data communications unit after the aircraft has landed. The system further includes a data reception unit in communication with the cellular infrastructure.

- (51) **Int. Cl.**  
**H04B 7/00** (2006.01)  
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- (52) **U.S. Cl.** ..... 701/14; 701/35; 701/16;  
 455/431; 342/33; 73/178 T
- (58) **Field of Classification Search** ..... 701/3;  
 701/14, 16; 340/945, 947, 948, 951, 960;  
 73/178 T; 342/33
- See application file for complete search history.

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## EX PARTE

REEXAMINATION CERTIFICATE  
ISSUED UNDER 35 U.S.C. 307THE PATENT IS HEREBY AMENDED AS  
INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in *italics* indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims 8-14 and 25-32 is confirmed.

Claims 1, 15, 18, 19 and 33 are determined to be patentable as amended.

Claims 2-7, 16, 17 and 20-24, dependent on an amended claim, are determined to be patentable.

New claims 34-51 are added and determined to be patentable.

1. An aircraft data transmission system, the aircraft having a data acquisition unit, *and the aircraft including a data storage medium having stored thereon flight data gathered in-flight by at least a first sensor on the aircraft*, comprising:

a communications unit located in the aircraft and in communication with the data acquisition unit;  
*at least a second sensor configured to sense a landing of the aircraft;*

a cellular infrastructure in communication with said communications unit after the aircraft has landed, *wherein the cellular infrastructure communicates said flight data, and wherein the communication is initiated [automatically upon] when at least the second sensor senses the landing of the aircraft; [and]*

a data reception unit in communication with said cellular infrastructure; *and*

*wherein said flight data includes time, airspeed, altitude, vertical acceleration, and heading data relating to a flight of the aircraft.*

15. An aircraft data transmission system, the aircraft having a data acquisition unit, *the aircraft including a data storage medium having stored thereon flight data gathered in-flight by at least one sensor on the aircraft*, comprising:

*sensing means for sensing a landing of the aircraft;*

*means for transmitting said flight data from the data acquisition unit, via a cellular infrastructure after the aircraft has landed, wherein transmission of the data is initiated [automatically upon] when the sensing means sense the landing of the aircraft; [and]*

*means for receiving said flight data from said cellular infrastructure; and*

*wherein said flight data includes time, airspeed, altitude, vertical acceleration, and heading data relating to a flight of the aircraft.*

18. A method of transmitting aircraft flight data from an aircraft, comprising:

receiving flight data from a data acquisition unit;

*receiving a signal indicating a landing of the aircraft from at least a first sensor;*

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transmitting said flight data via a cellular communications infrastructure after the aircraft has landed, wherein the cellular communications infrastructure is accessed *[automatically upon landing of the aircraft] in response to the signal; [and]*

receiving said transmitted flight data; *and*

*wherein said flight data is gathered in-flight by at least a second sensor on the aircraft, and includes time, airspeed, altitude, vertical acceleration, and heading data relating to a flight of the aircraft.*

19. A computer-implemented method of transmitting aircraft flight data from an aircraft, comprising:

receiving flight data from a digital flight data acquisition unit, *wherein said flight data is gathered in-flight by at least a first sensor on the aircraft, and includes time, airspeed, altitude, vertical acceleration, and heading data relating to a flight of the aircraft;*

*receiving a signal indicating a landing of the aircraft from at least a second sensor;*

processing said flight data to prepare said data for transmission; *and*

transmitting said processed data via a cellular infrastructure after the aircraft has landed, wherein the cellular infrastructure is accessed *[automatically upon landing of the aircraft] in response to the signal.*

33. A computer readable medium having stored thereon instructions which when executed by a processor, cause the processor to perform the steps of:

receiving flight data from a digital flight data acquisition unit in an aircraft, *wherein said flight data is gathered in-flight by at least a first sensor on the aircraft, and includes time, airspeed, altitude, vertical acceleration, and heading data relating to a flight of the aircraft;*

*receiving a signal indicating a landing of the aircraft from at least a second sensor;*

processing said flight data to prepare said data for transmission; *and*

transmitting said processed data via a cellular infrastructure when said aircraft has landed, wherein the cellular infrastructure is accessed *[automatically upon landing of the aircraft] in response to the signal.*

34. The system of claim 1, wherein the cellular infrastructure is a cellular telephone infrastructure.

35. The system of claim 34, wherein said data reception unit is in communication with said cellular infrastructure via the Internet.

36. The system of claim 34, wherein said data reception unit is in communication with said cellular infrastructure via the public switch telephone network.

37. The system of claim 34, wherein said data communications unit has at least one modem in communication with said cellular infrastructure and said data reception unit has at least one modem in communication with said cellular infrastructure.

38. The system of claim 34, wherein said communications unit includes:

a processor;

a serial card in communication with said processor;

at least one cell channel in communication with said serial card; *and*

at least one antenna in communication with said cell channel.

39. The system of claim 34, wherein said cellular infrastructure includes:  
an antenna;

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a transceiver subsystem in communication with said antenna; and  
a controller in communication with said transceiver subsystem.

40. The system of claim 34, wherein said data reception unit includes:

a router; and

a processor in communication with said router, said processor having a storage unit.

41. The system of claim 15, wherein the cellular infrastructure is a cellular telephone infrastructure.

42. The system of claim 41, wherein said means for transmitting data includes a processor.

43. The system of claim 41, wherein said means for receiving data includes a processor.

44. The method of claim 18, wherein the cellular communications infrastructure is a cellular telephone infrastructure.

45. The method of claim 19, wherein the cellular infrastructure is a cellular telephone infrastructure.

46. The method of claim 45 further comprising receiving said transmitted data at a flight operations center.

47. The method of claim 46 further comprising receiving said transmitted data and transmitting said received data via

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the Internet before receiving said transmitted data at a flight operations center.

48. The method of claim 46 further comprising receiving said transmitted data and transmitting said received data via the public-switched telephone network before receiving said transmitted data at a flight operations center.

49. The method of claim 45 wherein processing said flight data includes:

compressing said flight data;

encrypting said flight data;

segmenting said flight data; and

constructing packets of data from said segmented flight data.

50. The method of claim 45 wherein receiving said transmitted data includes:

acknowledging receipt of said transmitted data;

reassembling said received data;

decrypting said reassembled data;

uncompressing said decrypted data; and

storing said uncompressed data.

51. The method of claim 33, wherein the cellular infrastructure is a cellular telephone infrastructure.

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